## CLAIMS

1. A method of writing a waveguiding channel of increased refractive index into a sample, the channel having a width and a path, the method comprising:

providing a sample of material having a region which is photosensitive to light of a specific wavelength;

generating a spot of light at the specific wavelength, the spot having a periodic intensity pattern of high and low intensity fringes, and a width which is related to the width of the channel;

positioning the spot within the photosensitive region; and

causing relative movement between the sample and the light spot along the path of the channel to define the channel by exposing parts of the photosensitive region to the light spot to produce a change in refractive index.

2. A method according to claim 1, in which the relative movement is at a constant velocity and exposure to the light spot is continuous during the relative movement to produce a uniform change in refractive index.

3. A method according to claim 1 or claim 2, in which exposure to the light spot is discontinuous during the relative movement to produce a periodic change in refractive index along the channel, the periodic increase defining a Bragg grating.

4. A method according to claim 3, in which the discontinuous exposure comprises a plurality of adjacent exposures along the path of the channel.

5. A method according to claim 4, in which the adjacent exposures overlap such that in each exposure at least one high intensity fringe in the light spot exposes a part

of the photosensitive region already exposed to a high intensity fringe in a previous exposure.

6. A method according to claim 5, in which each adjacent exposure is offset from exact overlap so that resulting periodic increase in refractive index has a different period from the periodic intensity pattern of the light spot.

7. A method according to claim 6, in which the period of the periodic increase in refractive index varies so as to define a chirped or apodised Bragg grating or a Bragg grating containing arbitrary phase shifts.

8. A method according to any one of claims 3 to 7, in which the relative movement is non-perpendicular to the periodic intensity pattern so as to define a tilted Bragg grating.

9. A method according to any preceding claim, in which the light spot is substantially circular.

10. A method according to any one of claims 1 to 9, in which the light spot is generated by intersecting two beams of light at an angle to form an interference pattern.

11. A method according to any one of claims 1 to 9, in which the light spot is generated by exposure through a phase mask.

12. A method according to any one of the preceding claims, in which the low intensity fringes of the light spot have an intensity greater than zero.

13. A method according to any one of the preceding claims, in which the light spot is generated from polarised light, the method further comprising controlling the polarisation of the light to modify the change in refractive index.

14. A method according to any one of claims 1 to 13, in which the path of the channel is substantially linear.

15. A method according to any one of claims 1 to 13, in which the path of the channel comprises one or more curves.

16. A method according to any one of claims 1 to 15, in which the path of the channel comprises two or more interconnecting portions.

17. A method according to any preceding claim, and further comprising repeating the positioning of the spot and the causing of relative movement so as to define one or more additional channels with paths substantially the same as the path of the said channel.

18. A method according to any preceding claim, in which the photosensitive region is loaded with hydrogen and/or deuterium to enhance the photosensitivity.

19. A method according to claim 18, in which the hydrogen and/or deuterium is locked into the sample.

20. A method according to any one of claims 1 to 17, and further comprising subjecting the sample to a loading process to load hydrogen and/or deuterium into the photosensitive region, before exposure of the sample to the light spot.

21. A method according to claim 20, and further comprising, after the loading process, subjecting the sample to a thermal locking process to lock the hydrogen and/or deuterium into the photosensitive region, before exposure of the sample to the light spot.

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